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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/899,627	07/05/2001	Jong-won Lee	8021-55 (SS-14743-US)	5141
22150	7590	01/13/2005	EXAMINER	
F. CHAU & ASSOCIATES, LLC 130 WOODBURY ROAD WOODBURY, NY 11797			GUERRERO, MARIA F	
			ART UNIT	PAPER NUMBER
			2822	

DATE MAILED: 01/13/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/899,627

Applicant(s)

LEE ET AL.

Examiner

Maria Guerrero

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 October 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 12-26 and 28 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 12-26 and 28 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

1. This Office Action is in response to the Amendment filed October 18, 2004.

Status of Claims

2. Claims 1-11 and 27 are canceled. Claims 12-26 and 28 are pending.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

3. Claims 12-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Volant et al. (U.S. 6,368,484) in view of Sun et al. (U.S. 6,709,316).

Volant et al. teaches forming a barrier layer along a stepped portion over the surface of an interdielectric layer having a recessed region (Fig. 2A, col. 3, lines 10-20). Volant et al. discloses forming a copper seed layer by on the barrier layer and exposing

the barrier layer by chemical mechanical polishing (Fig. 2A-2B, col. 2, lines 1-20, col. 3, lines 10-28). Volant et al. shows forming a copper layer projecting above the surface of the interdielectric layer and planarizing the copper layer to form a copper metal interconnection layer (Fig. 2C-2D).

Volant et al. does not show a solution comprising an oxidizing agent, a pH controlling agent, a chelate reagent, water, and not including an abrasive. However, Sun et al. shows exposing the barrier layer by chemical mechanical polishing using a solution comprising an oxidizing agent, a pH controlling agent, a chelate reagent, water, and not including an abrasive (col. 6, lines 49-67, col. 7, lines 1-8, 30-67).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Volant et al. by specifying the use of the solution taught by Sun et al. in order avoid dishing and obtain a clean surface without any residues particles.

4. Claims 17 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Volant et al. (U.S. 6,368,484) in view of Sun et al. (U.S. 6,709,316) and Chopra et al. (US 6,511,912).

Volant et al. teaches forming a barrier layer along a stepped portion over the surface of an interdielectric layer having a recessed region (Fig. 2A, col. 3, lines 10-20). Volant et al. discloses forming a copper seed layer by on the barrier layer and exposing the barrier layer by chemical mechanical polishing (Fig. 2A-2B, col. 2, lines 1-20, col. 3, lines 10-28). Volant et al. shows forming a copper layer projecting above the surface of

the interdielectric layer and planarizing the copper layer to form a copper metal interconnection layer (Fig. 2C-2D).

Volant et al. does not show the copper seed layer being formed by physical vapor deposition method. However, Chopra et al. shows the copper seed layer being formed by physical vapor deposition method as conventional in the art (col. 1, lines 25-30, col. 3, lines 58-65).

Volant et al. does not show a solution comprising an oxidizing agent, a pH controlling agent, a chelate reagent, water, and not including an abrasive. However, Sun et al. shows exposing the barrier layer by chemical mechanical polishing using a solution comprising an oxidizing agent, a pH controlling agent, a chelate reagent, water, and not including an abrasive (col. 6, lines 49-67, col. 7, lines 1-8, 30-67).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Volant et al. by specifying the copper seed layer being formed by physical vapor deposition as taught by Chopra et al. and the use of the solution taught by Sun et al. in order to avoid dishing and obtain a clean surface without any residues particles.

5. Claims 12, 16, and 18-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kaufman et al. (U.S. 6,063,306) in view of Chan et al. (U.S. 6,495,200) and Sun et al. (U.S. 2003/0022801).

6. Kaufman et al. teaches forming a barrier layer (adhesive layer) along a stepped portion over the surface of an interdielectric layer having a recessed region (trench

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region and contact holes) (col. 1, lines 5-20, 25-65). Kaufman et al. shows exposing the barrier layer by chemical mechanical polishing using a solution comprising an oxidizing agent, a pH controlling agent, a chelate reagent, and water (col. 3, lines 40-48, 60-67, col. 4, lines 1-5, 57-65, col. 5, lines 5-65, col. 6, lines 3-55, col. 7, lines 13-20).

7. Furthermore, Kaufman et al. discloses oxidizing agent being hydrogen peroxide or an oxidizing agent of an ammonium series (col. 5, lines 5-30). Kaufman et al. shows the oxidizing agent from the ferric series as conventional use in the art (col. 2, lines 35-40). Kaufman et al. teaches the oxidizing agent being in a range of 0.01% to 3.0% by weight or 0.3% to about 17% by weight, the chelate reagent (benzotriazole (BTA)) being in a range of 0.01 to about 1% by weight (col. 3, lines 40-48, col. 5, lines 30-37, col. 6, lines 24-40). Kaufman et al. teaches controlling the pH using an acid (nitric acid) or a basic solution (ammonium hydroxide) and the pH being from about 2.0 to about 12.0 (col. 7, lines 12-22). Kaufman et al. discloses as conventional in the art the slurry comprising a chemically reactive solution (col. 2). Kaufman et al. teaches the solution having non-abrasive components (col. 10, lines 65-67, col. 11, lines 1-5).

8. Kaufman et al. does not specifically show forming a copper seed layer on the barrier layer. However, Kaufman et al. discloses forming a copper film on the barrier layer (col. 3, lines 60-67). Chan et al. shows the formation of the seed layer before forming a copper film as well known in the art (Fig. 1A-1D, col. 2, lines 10-32).

9. Kaufman et al. does not specifically show the exposing step does not include the use of an abrasive. However, Sun et al. discloses using an abrasive-free solution (paragraph 0048).

10. Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Kaufman et al. reference by including the conventional seed layer as taught Chan et al. and the abrasive-free solution as taught by Sun et al. to avoid dishing and erosion problems.

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

11. Claims 12, 14-15, 17, and 28 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-6 of U.S. Patent No. 6,610,596 in view of Kaufman et al. (U.S. 6,063,306) and Chan et al. (U.S. 6,495,200). Claims 1-6 of U.S. Patent No. 6,610,596 recites all the limitations of claims 12, 14-15, and 17, except for the copper seed layer and the solution comprising an oxidizing agent, a pH controlling agent, a chelate reagent, and water. However, Chan et al. shows the formation of the seed layer before forming a copper film as well known in

the art (Fig. 1A-1D, col. 2, lines 10-32). Kaufman et al. shows exposing the barrier layer by chemical mechanical polishing using a solution comprising an oxidizing agent, a pH controlling agent, a chelate reagent, and water (col. 3, lines 40-48, 60-67, col. 4, lines 1-5, 57-65, col. 5, lines 5-65, col. 6, lines 3-55, col. 7, lines 13-20).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to include the recitation of the copper seed layer and the solution comprising an oxidizing agent, a pH controlling agent, a chelate reagent, and water as suggested by Kaufman et al. and Chan et al. because is conventional employed in the art.

Response to Arguments

12. Applicant's arguments with respect to claims 12-26 and 28 have been considered but are moot in view of the new ground(s) of rejection.

Applicant's arguments filed October 18, 2004 have been fully considered but they are not persuasive. The Double patenting rejection is maintained.

In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a

reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).


Conclusion

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Maria Guerrero whose telephone number is 571-272-1837.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on 571-272-1852. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

December 29, 2004


MARIA F. GUERRERO
PRIMARY EXAMINER